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(54) **A process for producing a metal base plate having a projected portion formed with a slit, a die and a mold structure used in the same**

Verfahren zur Herstellung einer Metallplatte mit erhabenem und Schlitz versehenem Teil, Matrice und Formstruktur

Méthode de production d'une tôle avec projection formée avec une fente, matrice et structure de moule

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(73) Proprietor: **Ricoh Company, Ltd.**
Tokyo 143-8555 (JP)

(72) Inventors:
• **Kondo, Takafunmi**
c/o Ricoh Company, Ltd
Ohta-ku
Tokyo 143-8555 (JP)

• **Ito, Hideto**
c/o Hasama Ricoh, Inc
Tome-Shi
Miyagi 987-0511 (JP)

(74) Representative: **Lamb, Martin John Carstairs**
Marks & Clerk LLP
90 Long Acre
London
WC2E 9RA (GB)

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EP 1 710 027 B1

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Description

[0001] The present invention relates to a process, a die and a mold structure for producing a metal base plate or a metal base sheet having a cylindrical (tubular) projected portion formed with at least one slit which extends from a leading end toward a base end of the cylindrical projected portion.

[0002] Heretofore, there has been proposed a technology for forming a cylindrical projected portion, in which a pair of slits is formed from a leading end toward a base end thereof, on a metal base plate or a metal base sheet as a material. As a forming method of the metal base plate or the sheet of this kind, for example, JP09-201627 A discloses a burring punch and burring, and JP-09-267140A discloses a joining method of a plate material and a punch used in the joining method.

[0003] For example, JP-09-267140A forms the cylindrical projected portion having the slits by a piercing process, a slit incising process, and a burring process. The processing disclosed in JP-09-267140A has characteristics that an incision of the slits formed by the slit incising process has a non-penetrated, alphabet "V"-shaped cross section, and the burring process is applied to the plate material from a back surface side of a slit incised portion formed by the slit incising process. Moreover, JP-09-267140A discloses the punch in which an alphabet "V"-shaped protrusion is arranged on a flat part of a leading end of the punch, as a tool used in the slit incising process.

[0004] However, there has been a problem in the conventional technology, in JP-09-267140A in particular, that the slits cannot be formed even if the burring process is applied when a depth of the slit incised portion is shallow, and thus it takes much time on adjustment. In addition, when the punch is utilized to form a slit portion near a hole to which a high precision is required for example, it is likely that the hole is deformed by excess thickness smashed and formed by the slit formation. Further disadvantage of the conventional technology is that more processes in the processing are necessary as compared with normal processing due to the slit incising process, causing increase in costs.

[0005] The present invention has been made in view of the above-mentioned circumstances, and therefore, at least one objective of the present invention is to provide a process for producing a metal base plate or a metal base sheet having a projected portion formed with at least one slit which extends from a leading end toward a base end of the cylindrical projected portion in which a slit incising process is unnecessary, and to provide a die and a mold structure used in the producing process.

[0006] To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention provides a process for producing a metal base plate according to claim 1, the metal base plate having a projected portion formed with at least one slit which extends from a leading

end toward a base end of the projected portion by inserting a punch into a die through the metal base plate, wherein the producing process comprises: preparing the punch including a leading end portion having at least one ridge line, the at least one ridge line extends substantially from a center portion of the leading end portion of the punch substantially to an edge portion of a peripheral surface of the punch, and each side face of the at least one ridge line of the punch is inclined from the at least one ridge line in a direction opposite to the leading end portion of the punch; preparing the die including a hole into which the punch is inserted and which has at least one projected portion projected from an inner surface of the hole; interposing the metal base plate between the punch and the die, while the hole of the die and the punch are aligned with a location of the projected portion to be formed and the at least one ridge line of the punch and an apex portion of the corresponding at least one projected portion of the die are aligned with each other; and inserting the punch into the hole of the die through the metal base plate to form the metal base plate having the projected portion formed with the at least one slit, in such a manner that the at least one slit of the projected portion is formed by the edge portion of the peripheral surface of the punch and the corresponding at least one projected portion of the die by the insertion of the punch into the hole of the die.

[0007] Here, the wording "center portion" of the leading end portion of the punch means an area which includes a center point defined as an intersection point between a leading end face of the punch and a central axis of the punch and which excludes a peripheral portion of the leading end face near the edge of the peripheral surface of the punch. For example, the at least one ridge line of the punch may extend from the center point of the leading end portion of the punch, or may extend from a part of the center portion of the leading end of the punch which is slightly away from the center point, toward the edge portion of the peripheral surface of the punch. In addition, the at least one ridge line may be disposed to cross the center portion or to substantially cross the center portion for example, so as to connect one edge portion and the other edge portion of the peripheral surface of the punch.

[0008] Preferably, the at least one ridge line extends from the center point to the edge portion of the peripheral surface of the punch, or extends to cross the center portion from one edge portion to the other edge portion of the peripheral surface of the punch.

[0009] Moreover, two or more ridge lines may be disposed to extend from the center portion to the edge portions of the peripheral surface of the punch. In this case, each of the ridge lines may be disposed to extend from the part of the center portion of the punch slightly away from the central axis of the punch to the edge portion of the peripheral surface of the punch.

[0010] Here, it is intended that the wording "metal base plate" also includes a term "metal base sheet".

[0011] Following are preferred embodiments (1) to (3)

of the producing process according to the present invention. Any combinations thereof may be considered to be preferred ones of the present invention unless any contradictions occur.

(1) The at least one ridge line of the leading end portion of the punch is disposed substantially across the center of the punch.

(2) The at least one ridge line comprises a plurality of ridge lines each extending from the center portion of the leading end portion of the punch substantially to the edge portion of the peripheral surface of the punch to form the leading end portion of the punch in a pyramid-like shape, and the at least one projected portion provided in the hole of the die includes a plurality of projected portions each corresponding to one of the plurality of ridge lines of the leading end portion of the punch, so as to form the metal base plate having the cylindrical projected portion formed with at least three slits extending from the leading end to the base end of the cylindrical projected portion.

(3) The pyramid-like shape of the leading end portion of the punch is formed substantially symmetrical.

[0012] The present invention also provides a die used in the producing process according to any one of the producing process described above, wherein the projected portion is formed at an angle from 60 degrees to 90 degrees or wherein the projected portion is formed angular.

[0013] In one embodiment of the die used in the producing process, the apex portion of the projected portion is formed in a minute rounded shape.

[0014] The present invention also provides a mold structure according to claim 4, the mold structure being suitable for forming a metal base plate having a projected portion formed with at least one slit which extends from a leading end toward a base end of the projected portion by inserting a punch into a die through the metal base plate, comprising: the punch; and the die, wherein the punch includes a leading end portion having at least one ridge line, the at least one ridge line extends substantially from a center portion of the leading end portion of the punch substantially to an edge portion of a peripheral surface of the punch, and each side face of the at least one ridge line of the punch is inclined from the at least one ridge line in a direction opposite to the leading end portion of the punch, the die includes a hole into which the punch is inserted and which has at least one projected portion projected from an inner surface of the hole, and an apex portion of the at least one projected portion and the at least one ridge line of the punch are configured to be aligned with each other when the punch is to be inserted into the hole of the die through the metal base plate to form the metal base plate having the projected

portion formed with the at least one slit, in such a manner that the at least one slit of the projected portion is formed by the edge portion of the peripheral surface of the punch and the corresponding at least one projected portion of the die by the insertion of the punch into the hole of the die.

[0015] Following are preferred embodiments (1) to (6) of the mold structure according to the present invention. Any combinations thereof may be considered to be preferred ones of the present invention unless any contradictions occur.

(1) The at least one ridge line of the leading end portion of the punch is disposed substantially across the center of the punch.

(2) The at least one ridge line comprises a plurality of ridge lines each extending from the center portion of the leading end portion of the punch substantially to the edge portion of the peripheral surface of the punch to form the leading end portion of the punch in a pyramid-like shape, and the at least one projected portion provided in the hole of the die includes a plurality of projected portions each corresponding to one of the plurality of ridge lines of the leading end portion of the punch, so as to form the metal base plate having the cylindrical projected portion formed with at least three slits extending from the leading end to the base end of the cylindrical projected portion.

(3) The pyramid-like shape of the leading end portion of the punch is formed substantially symmetrical.

(4) The projected portion is formed at an angle from 60 degrees to 90 degrees.

(5) The projected portion is formed angular.

(6) The apex portion of the projected portion is formed in a minute rounded shape.

[0016] According to the present invention, the metal base plate or the metal base sheet is processed by combining the punch having at least one ridge line on the leading end portion thereof and the die having at least one projected portion, and the apex portion of the projected portion of the die are arranged substantially on a same line with the at least one ridge line of the leading end portion of the punch, so as to form the projected portion in which at least one slit is formed from the leading end toward the base end of the projected portion on the metal base plate or the metal base sheet as a material. Therefore, it is possible to produce the metal base plate or the metal base sheet having the projected portion formed with at least one slit which extends from the leading end to the base end thereof without requiring a slit incising process performed in the conventional technology.

[0017] It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

[0018] In the following, the present invention is explained in greater detail by means of several embodiments thereof in conjunction with the accompanying drawings. Note that the accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this description. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

FIG. 1 is a perspective view showing a die used in burring processing according to a first embodiment of the present invention.

FIG. 2 is a front view showing the die of FIG. 1.

FIG. 3 is a cross sectional view showing the die of FIG. 1.

FIG. 4 is a perspective view showing a punch used in the burring processing according to the first embodiment of the present invention.

FIG. 5 is a front view showing the punch of FIG. 4.

FIG. 6 is a view schematically showing a positional relation between the die and the punch.

FIG. 7 is a cross sectional view taken along a line 7-7 shown in FIG. 6.

FIG. 8 is an enlarged view partially showing the cross sectional view of FIG. 7.

FIG. 9 is a view schematically showing a metal base plate or a metal base sheet formed with a prepared hole and provided in a mold having the punch and the die according to the mold and a producing process of the first embodiment of the present invention.

FIG. 10 is a view schematically showing a state in which the punch is pressed into the metal base plate or the metal base sheet by a press working device or the like.

FIG. 11 is a perspective view showing the metal base plate or the metal base sheet and a molded portion processed by the mold and the producing process according to the first embodiment of the present invention.

FIG. 12 is a front view showing a formed body of FIG. 11.

FIG. 13 is a perspective view showing a die used in burring processing according to a second embodiment of the present invention.

FIG. 14 is a front view showing the die of FIG. 13.

FIG. 15 is a cross sectional view showing the die of FIG. 13.

FIG. 16 is a perspective view showing a punch used in the burring processing according to the second embodiment of the present invention.

FIG. 17 is a front view showing the punch of FIG. 16.

FIG. 18 is a perspective view showing a metal base plate or a metal base sheet and a molded portion processed by a mold and a producing process according to the second embodiment of the present invention.

FIG. 19 is a front view showing a formed body of FIG. 18.

[0019] Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0020] FIGS. 1 to 3 show a die 1, and FIGS. 4 and 5 show a punch 3 which are used in burring processing according to a first embodiment of the present invention. Referring to FIGS. 1 to 5, in the present embodiment, the die 1 includes four angular projected portions 2 which are arranged evenly relative to the die 1. A leading end portion of the punch 3 has a pyramid-like shape structured by four ridge lines 4. The ridge lines 4 are arranged evenly relative to the punch 3. Each of the angular projected portions 2 is so disposed that a positional relation in which a leading end portion of each of the angular projected portions 2 is substantially on the same line of the corresponding one of the ridge lines 4 of the punch 3 is satisfied (see FIGS. 7 and 8).

[0021] FIG. 6 schematically shows the positional relation between the die 1 and the punch 3. FIG. 7 is a cross sectional view taken along a line 7-7 shown in FIG. 6, and FIG. 8 is an enlarged view partially showing the cross sectional view of FIG. 7. The die 1 and the punch 3 are provided in a mold (not shown) according to the positional relation shown in FIG. 6.

[0022] FIG. 9 schematically shows a metal base plate 5 or a metal base sheet 5 formed with a prepared hole 6 and provided in the mold having the punch 3 and the die 1 according to the mold and a producing process of the first embodiment of the present invention. FIG. 10 schematically shows a state that the punch 3 is pressed into the metal base plate 5 or the metal base sheet 5 by a press working device or the like. Referring to FIG. 9, the metal base plate 5 or the metal base sheet 5, formed with

the prepared hole 6 by the application of perforating processing utilizing a known method, is disposed in the mold in which the punch 3 and the die 1 are arranged, and the punch 3 is then pressed into the metal base plate 5 or the metal base sheet 5 by the press working device or any other appropriate means, as shown in FIG. 10. Note that FIGS. 9 and 10 also show the projected portions 2, a direction of movement 7 of the die 1, a punch holder 8, and a spring 9. Here, it is to be appreciated that the present invention is not limited by a method described in FIGS. 9 and 10. For example, such a method may be employed wherein the die 1 is fixed, and the punch holder 8, on which the metal base plate (metal base sheet) 5 is located, is configured to move toward the punch 3 together with the punch 3 so as to allow the metal base plate (metal base sheet) 5 to contact with the die 1 and to press the punch 3 into the metal base plate (metal base sheet) 5. In addition, the spring 9 may be replaced by an elastic member or other suitable means, or may be omitted where appropriate.

[0023] FIG. 11 shows the metal base plate 5 or the metal base sheet 5 and a molded portion processed by the mold and the producing process according to the first embodiment of the present invention, and FIG. 12 shows a formed body shown in FIG. 11. It can be seen from FIGS. 11 and 12 that the formed body comprising the metal base plate (metal base sheet) 5 and the formed portion is processed by the method according to FIGS. 9 and 10, and a cylindrical (tubular) projected portion 11 formed with four slits 10 from a leading end toward a base end thereof is formed.

[0024] According to the present embodiment of the invention, a total of four ridge lines 4 and angular projected portions 2, respectively, are provided. However, it is to be noted that the present invention is not limited to four ridge lines 4 and four angular projected portions 2. The number of the ridge lines 4 and the angular projected portions 2 can be increased or decreased as needs arise unless the number of the ridge lines 4 and the angular projected portions 2 are three or more, respectively. In addition, the prepared hole 6 does not necessarily have to be formed on the metal base plate 5 or the metal base sheet 5. The metal base plates (metal base sheets) 5 with and without the prepared hole 6 may be properly used where appropriate.

[0025] FIGS. 13 to 15 show a die 13, and FIGS. 16 and 17 show a punch 12, which are used in burring processing according to a second embodiment of the present invention. As described above, the first embodiment of the invention discloses the exemplary method of forming the cylindrical (tubular) projected portion 11 provided with three or more slits 10. The second embodiment of the invention explains an exemplary method of forming the cylindrical (tubular) projected portion 11 having a pair of slits 10 (i.e. two slits 10).

[0026] Referring to FIGS. 13 to 17, the die 13 is provided with a pair of angular projected portions 2 arranged evenly relative to the die 13, and a leading end portion

of the punch 12 has at least one ridge line 4. In the present embodiment of the invention, the leading end portion of the punch 12 includes one ridge line 4. The pair of angular projected portions 2 are disposed such that a leading end portion (or the apex portion) of each of the angular projected portions 2 is arranged substantially on the same line with the ridge line 4 of the leading end portion of the punch 12. Here, since the positional relation between the die 13 and the punch 12, and the operation thereof are similar to those described in the first embodiment, they will not be explained in detail.

[0027] FIG. 18 shows the metal base plate 5 or the metal base sheet 5 and a molded portion processed by a mold and a producing process according to the second embodiment of the present invention. FIG. 19 shows a formed body shown in FIG. 18. It can be seen from FIGS. 18 and 19 that the formed body (the metal base plate and the formed portion) is processed by the method according to FIGS. 13 and 17, and a cylindrical (tubular) projected portion 11 formed with two slits 10 from a leading end toward a base end thereof is formed.

[0028] According to the embodiments of the invention described in the foregoing, at least one ridge line 4 is arranged substantially from a center portion of the leading end portion of the punch 3 or the punch 12 substantially to an edge portion of a peripheral surface of the punch 3 or the punch 12, and each side face of the at least one ridge line 4 of the punch 3 or the punch 12 is inclined from the at least one ridge line 4 in a direction opposite to the leading end portion of the punch 3 or the punch 12. In one embodiment of the present invention, the at least one ridge line 4 is disposed substantially across the center of the punch. Therefore, it is possible to form the well-balanced cylindrical (tubular) projected portion 11 with the slits 10 in a process of the burring processing, and to form the cylindrical (tubular) projected portion 11 having substantially uniform height.

[0029] In addition, according to the embodiment of the invention, a combination of the punch 3 and the die 1 is used, in which the leading end portion of the punch 3 is in the pyramid-like shape and the die 1 has the number of angular projected portions 2 corresponding to the pyramid-like shape of the leading end portion of the punch 3, so as to form the cylindrical (tubular) projected portion 11 formed with at least three slits 10 from the leading end portion to the base end portion thereof on the metal base plate 5 or the metal base sheet 5 as a material. Because the metal base plate (metal base sheet) 5 is subjected to processing by the combination as well as the ridge lines 4 of the pyramid-like shape of the leading end portion of the punch 3 and the apex portions of the angular projected portions 2 are arranged to be substantially on the same line relative to each other, it is possible to form the cylindrical (tubular) projected portion 11 in which three or more slits 10 are formed from the leading end portion to the base end portion thereof without requiring a slit incising process performed in a conventional technology.

[0030] Moreover, according to the embodiment of the invention, the pyramid-like shape of the leading end portion of the punch 3 is formed substantially symmetrical. Therefore, it is possible to form the more well-balanced cylindrical (tubular) projected portion 11 with the slits 10 in the burring processing process, and to form the cylindrical (tubular) projected portion 11 having substantially uniform height.

[0031] Furthermore, the angular projected portions 2 are formed to have angles from 60 degrees to 90 degrees. Therefore, the slits 10 can be efficiently formed in the burring processing process. Additionally, a life of the die 1 or the die 13 can be prolonged, so that it is possible to increase productivity.

[0032] In addition, the die 1 or the die 13, in which the leading end portion of each of the angular projected portions 2 is in a minute rounded shape (R-shape), is used. Therefore, it is possible to prolong the life of the die 1 or the die 13 and to increase the productively.

[0033] Although in the embodiments of the invention, the cylindrical (tubular) projected portion 11 formed with the slits 10 from the leading end toward the base end thereof is processed on the metal base plate (metal base sheet) 5 without depending upon the slit incising process, the present invention may be applied to production of the metal base plate or the metal base sheet having the projected portion with slits in which a horizontal cross section of the projected portion has a configuration other than cylindrical or tubular, such as a polygonal configuration.

Claims

1. A process for producing a metal base plate (5) having a projected portion (11) formed with at least one slit (10) which extends from a leading end toward a base end of the projected portion (11) by inserting a punch (3 or 12) into a die (1 or 13) through the metal base plate (5), including:

preparing the punch (3 or 12) which includes a leading end portion having at least one ridge line (4), the at least one ridge line (4) extending substantially from a center portion of the leading end portion of the punch (3 or 12) substantially to an edge portion of a peripheral surface of the punch (3 or 12) and each side face of the at least one ridge line (4) of the punch (3 or 12) is inclined from the at least one ridge line (4) in a direction opposite to the leading end portion of the punch (3 or 12),

characterized in that the producing process comprises:

preparing the die (1 or 13) including a hole into which the punch (3 or 12) is inserted and which has at least one projected portion (2) projected

from an inner surface of the hole;

interposing the metal base plate (5) between the punch (3 or 12) and the die (1 or 13), while the hole of the die (1 or 13) and the punch (3 or 12) are aligned with a location of the projected portion (11) to be formed and the at least one ridge line (4) of the punch (3 or 12) and an apex portion of the corresponding at least one projected portion (2) of the die (1 or 13) are aligned with each other; and

inserting the punch (3 or 12) into the hole of the die (1 or 13) through the metal base plate (5) to form the metal base plate (5) having the projected portion (11) formed with the at least one slit (10), in such a manner that the at least one slit (10) of the projected portion (11) is formed by the edge portion of the peripheral surface of the punch (3 or 12) and the corresponding at least one projected portion (2) of the die (1 or 13) by the insertion of the punch (3 or 12) into the hole of the die (1 or 13).

2. A process according to claim 1, wherein the projected portion to be formed at the metal base plate (5) is cylindrical.
3. A process according to claim 1, wherein the projected portion to be formed at the metal base plate (5) is polygonal.
4. A mold structure for forming a metal base plate (5) having a projected portion (11) formed with at least one slit (10) which extends from a leading end toward a base end of the projected portion (11) by inserting a punch (3 or 12) into a die (1 or 13) through the metal base plate (5), comprising:

the punch (3 or 12), which includes a leading end portion having at least one ridge line (4), the at least one ridge line (4) extending substantially from a center portion of the leading end portion of the punch (3 or 12) substantially to an edge portion of a peripheral surface of the punch (3 or 12) and each side face of the at least one ridge line (4) of the punch (3 or 12) is inclined from the at least one ridge line (4) in a direction opposite to the leading end portion of the punch (3 or 12); and
the die (1 or 13),

characterized in that:

the die (1 or 13) includes a hole into which the punch (3 or 12) is inserted and which has at least one projected portion (2) projected from an inner surface of the hole, and an apex portion of the at least one projected portion (2) and the at least one ridge line (4) of the punch (3 or 12) are con-

- figured to be aligned with each other when the punch (3 or 12) is to be inserted into the hole of the die (1 or 13) through the metal base plate (5) to form the metal base plate (5) having the projected portion (11) formed with the at least one slit (10), in such a manner that the at least one slit (10) of the projected portion (11) is formed by the edge portion of the peripheral surface of the punch (3 or 12) and the corresponding at least one projected portion (2) of the die (1 or 13) by the insertion of the punch (3 or 12) into the hole of the die (1 or 13).
5. A mold structure according to claim 4, wherein the projected portion to be formed at the metal base plate (5) is cylindrical. 15
 6. A mold structure according to claim 4, wherein the projected portion to be formed at the metal base plate (5) is polygonal. 20
 7. A mold structure according to claim 4, wherein the at least one ridge line (4) of the leading end portion of the punch (3 or 12) is disposed substantially across the center of the punch (3 or 12). 25
 8. A mold structure according to claim 4, wherein the at least one ridge line (4) comprises a plurality of ridge lines (4) each extending from the center portion of the leading end portion of the punch (3) substantially to the edge portion of the peripheral surface of the punch (3) to form the leading end portion of the punch (3) in a pyramid-like shape, and the at least one projected portion (2) provided in the hole of the die (1) includes a plurality of projected portions (2) each corresponding to one of the plurality of ridge lines (4) of the leading end portion of the punch (3), so as to form the metal base plate (5) having the projected portion (11) formed with at least three slits (10) extending from the leading end to the base end of the projected portion (11). 30 35 40
 9. A mold structure according to claim 8, wherein the pyramid-like shape of the leading end portion of the punch (3) is formed substantially symmetrical. 45
 10. A mold structure according to any one of claims 4 to 9, wherein the projected portion (2) is formed at an angle from 60 degrees to 90 degrees. 50
 11. A mold structure according to any one of claims 4 to 9, wherein the projected portion (2) is formed angular. 55
 12. A mold structure according to claim 10 or 11, wherein the apex portion of the projected portion (2) is formed in a minute rounded shape.

Patentansprüche

1. Verfahren zum Herstellen einer Metall-Grundplatte (5), die einen vorspringenden Abschnitt (11) hat, der mit wenigstens einem Schlitz (10) geformt ist, der sich von einem vorderen Ende zu einem Basisende des vorspringenden Abschnitts (11) hin erstreckt, durch Einsetzen eines Stempels (3 oder 12) in ein Gesenk (1 oder 13) durch die Metall-Grundplatte (5), wobei das Verfahren Folgendes einschließt:

Vorbereiten des Stempels (3 oder 12), der einen vorderen Endabschnitt einschließt, der wenigstens eine Firstlinie (4) hat, wobei sich die wenigstens eine Firstlinie (4) im Wesentlichen von einem Mittelabschnitt des vorderen Endabschnitts des Stempels (3 oder 12) im Wesentlichen bis zu einem Kantenabschnitt einer Umfangsfläche des Stempels (3 oder 12) erstreckt und jede Seitenfläche der wenigstens einen Firstlinie (4) des Stempels (3 oder 12) von der wenigstens einen Firstlinie (4) aus in einer Richtung, entgegengesetzt zu dem vorderen Endabschnitt des Stempels (3 oder 12), geneigt ist,

dadurch gekennzeichnet, dass das Herstellungsverfahren Folgendes umfasst:

Vorbereiten des Gesenks (1 oder 13), das ein Loch einschließt, in das der Stempel (3 oder 12) eingesetzt wird, und das wenigstens einen vorspringenden Abschnitt (2) hat, der von einer Innenfläche des Lochs aus vorspringt, Einfügen der Metall-Grundplatte (5) zwischen den Stempel (3 oder 12) und das Gesenk (1 oder 13), während das Loch des Gesenks (1 oder 13) und der Stempel (3 oder 12) mit einer Position des zu formenden vorspringenden Abschnitts (11) ausgerichtet werden und die wenigstens eine Firstlinie (4) des Stempels (3 oder 12) und ein Scheitelabschnitt des entsprechenden wenigstens einen vorspringenden Abschnitts (2) des Gesenks (1 oder 13) miteinander ausgerichtet werden, und Einsetzen des Stempels (3 oder 12) in das Loch des Gesenks (1 oder 13) durch die Metall-Grundplatte (5), um die Metall-Grundplatte (5), die den vorspringenden Abschnitt (11) hat, der mit dem wenigstens einen Schlitz (10) geformt ist, auf eine solche Weise zu formen, dass der wenigstens eine Schlitz (10) des vorspringenden Abschnitts (11) durch den Kantenabschnitt der Umfangsfläche des Stempels (3 oder 12) und den entsprechenden wenigstens einen vorspringenden Abschnitt (2) des Gesenks (1 oder 13) durch das Einsetzen des Stempels (3 oder 12) in das Loch des Gesenks (1 oder 13) geformt wird.

2. Verfahren nach Anspruch 1, wobei der an der Metall-Grundplatte (5) zu formende vorspringende Abschnitt zylindrisch ist.

3. Verfahren nach Anspruch 1, wobei der an der Metall-Grundplatte (5) zu formende vorspringende Abschnitt vieleckig ist.

4. Formstruktur zum Formen einer Metall-Grundplatte (5), die einen vorspringenden Abschnitt (11) hat, der mit wenigstens einem Schlitz (10) geformt ist, der sich von einem vorderen Ende zu einem Basisende des vorspringenden Abschnitts (11) hin erstreckt, durch Einsetzen eines Stempels (3 oder 12) in ein Gesenk (1 oder 13) durch die Metall-Grundplatte (5), wobei die Struktur Folgendes umfasst:

den Stempel (3 oder 12), der einen vorderen Endabschnitt einschließt, der wenigstens eine Firstlinie (4) hat, wobei sich die wenigstens eine Firstlinie (4) im Wesentlichen von einem Mittelabschnitt des vorderen Endabschnitts des Stempels (3 oder 12) im Wesentlichen bis zu einem Kantenabschnitt einer Umfangsfläche des Stempels (3 oder 12) erstreckt und jede Seitenfläche der wenigstens einen Firstlinie (4) des Stempels (3 oder 12) von der wenigstens einen Firstlinie (4) aus in einer Richtung, entgegengesetzt zu dem vorderen Endabschnitt des Stempels (3 oder 12), geneigt ist, und das Gesenk (1 oder 13),

dadurch gekennzeichnet, dass:

das Gesenk (1 oder 13) ein Loch einschließt, in das der Stempel (3 oder 12) eingesetzt wird, und das wenigstens einen vorspringenden Abschnitt (2) hat, der von einer Innenfläche des Lochs aus vorspringt, und ein Scheitelabschnitt des wenigstens einen vorspringenden Abschnitts (2) und die wenigstens eine Firstlinie (4) des Stempels (3 oder 12) dafür konfiguriert sind, miteinander ausgerichtet zu werden, wenn der Stempel (3 oder 12) in das Loch des Gesenks (1 oder 13) durch die Metall-Grundplatte (5) eingesetzt wird, um die Metall-Grundplatte (5), die den vorspringenden Abschnitt (11) hat, der mit dem wenigstens einen Schlitz (10) geformt ist, auf eine solche Weise zu formen, dass der wenigstens eine Schlitz (10) des vorspringenden Abschnitts (11) durch den Kantenabschnitt der Umfangsfläche des Stempels (3 oder 12) und den entsprechenden wenigstens einen vorspringenden Abschnitt (2) des Gesenks (1 oder 13) durch das Einsetzen des Stempels (3 oder 12) in das Loch des Gesenks (1 oder 13) geformt wird.

5. Formstruktur nach Anspruch 4, wobei der an der Me-

tall-Grundplatte (5) zu formende vorspringende Abschnitt zylindrisch ist.

6. Formstruktur nach Anspruch 4, wobei der an der Metall-Grundplatte (5) zu formende vorspringende Abschnitt vieleckig ist.

7. Formstruktur nach Anspruch 4, wobei die wenigstens eine Firstlinie (4) des vorderen Endabschnitts des Stempels (3 oder 12) im Wesentlichen über der Mitte des Stempels (3 oder 12) angeordnet ist.

8. Formstruktur nach Anspruch 4, wobei die wenigstens eine Firstlinie (4) mehrere Firstlinien (4) umfasst, die sich im Wesentlichen von dem Mittelabschnitt des vorderen Endabschnitts des Stempels (3) aus im Wesentlichen bis zu dem Kantenabschnitt der Umfangsfläche des Stempels (3) erstrecken, um den vorderen Endabschnitt des Stempels (3) in einer pyramidenartigen Gestalt zu formen, und der wenigstens eine vorspringende Abschnitt (2), der in dem Loch des Gesenks (1) bereitgestellt wird, mehrere vorspringende Abschnitte (2) umfasst, die jeweils einer der mehreren Firstlinien (4) des vorderen Endabschnitts des Stempels (3) entsprechen, um so die Metall-Grundplatte (5) zu formen, die den vorspringenden Abschnitt (11) hat, der mit wenigstens drei Schlitzen (10) geformt ist, die sich von dem vorderen Ende bis zu dem Basisende des vorspringenden Abschnitts erstrecken.

9. Formstruktur nach Anspruch 8, wobei die pyramidenartige Gestalt des vorderen Abschnitts des Stempels (3) im Wesentlichen symmetrisch geformt ist.

10. Formstruktur nach einem der Ansprüche 4 bis 9, wobei der vorspringende Abschnitt (2) in einem Winkel von 60 Grad bis 90 Grad geformt ist.

11. Formstruktur nach einem der Ansprüche 4 bis 9, wobei der vorspringende Abschnitt (2) winklig geformt ist.

12. Formstruktur nach Anspruch 10 oder 11, wobei der Scheitelabschnitt des vorspringenden Abschnitts (2) in einer schwach abgerundeten Gestalt geformt ist.

Revendications

1. Procédé pour produire une tôle de base (5) ayant une partie en saillie (11) formée avec au moins une fente (10) qui s'étend à partir d'une extrémité d'attaque vers une extrémité de base de la partie en saillie (11) en insérant un poinçon (3 ou 12) dans un moule (1 ou 13) à travers la tôle de base (5), comprenant les étapes consistant à :

préparer le poinçon (3 ou 12) qui comprend une partie d'extrémité d'attaque ayant au moins une ligne de couronnement (4), la au moins une ligne de couronnement (4) s'étendant sensiblement d'une partie centrale de la partie d'extrémité d'attaque du poinçon (3 ou 12) sensiblement jusqu'à une partie de bord d'une surface périphérique du poinçon (3 ou 12) et chaque face latérale de la au moins une ligne de couronnement (4) du poinçon (3 ou 12) est inclinée à partir de la au moins une ligne de couronnement (4) dans une direction opposée à la partie d'extrémité d'attaque du poinçon (3 ou 12),

caractérisé en ce que le procédé de production comprend les étapes consistant à :

préparer le moule (1 ou 13) comprenant un trou dans lequel le poinçon (3 ou 12) est inséré et qui a au moins une partie en saillie (2) faisant saillie d'une surface interne du trou ; intercaler la tôle de base (5) entre le poinçon (3 ou 12) et le moule (1 ou 13), alors que le trou du moule (1 ou 13) et le poinçon (3 ou 12) sont alignés avec un emplacement de la partie en saillie (11) à former et la au moins une ligne de couronnement (4) du poinçon (3 ou 12) et une partie de sommet de la au moins une partie en saillie (2) correspondante du moule (1 ou 13) sont alignées l'une par rapport à l'autre ; et insérer le poinçon (3 ou 12) dans le trou du moule (1 ou 13) à travers la tôle de base (5) pour former la tôle de base (5) ayant la partie en saillie (11) formée avec la au moins une fente (10), de sorte que la au moins une fente (10) de la partie en saillie (11) est formée par la partie de bord de la surface périphérique du poinçon (3 ou 12) et correspondant à la au moins une partie en saillie (2) du moule (1 ou 13) par l'insertion du poinçon (3 ou 12) dans le trou du moule (1 ou 13).

2. Procédé selon la revendication 1, dans lequel la partie en saillie à former au niveau de la tôle de base (5) est cylindrique.
3. Procédé selon la revendication 1, dans lequel la partie en saillie à former au niveau de la tôle de base (5) est polygonale.
4. Structure de moule pour former une tôle de base (5) ayant une partie en saillie (11) formée avec au moins une fente (10) qui s'étend à partir d'une extrémité d'attaque vers une extrémité de base de la partie en saillie (11) en insérant un poinçon (3 ou 12) dans un moule (1 ou 13) à travers la tôle de base (5), comprenant :

le poinçon (3 ou 12), qui comprend une partie d'extrémité d'attaque ayant au moins une ligne de couronnement (4), la au moins une ligne de couronnement (4) s'étendant sensiblement à partir d'une partie centrale de la partie d'extrémité d'attaque du poinçon (3 ou 12) sensiblement jusqu'à une partie de bord d'une surface périphérique du poinçon (3 ou 12) et chaque face latérale de la au moins une ligne de couronnement (4) du poinçon (3 ou 12) est inclinée à partir de la au moins une ligne de couronnement (4) dans une direction opposée à la partie d'extrémité d'attaque du poinçon (3 ou 12) ; et le moule (1 ou 13),

caractérisée en ce que :

le moule (1 ou 13) comprend un trou dans lequel le poinçon (3 ou 12) est inséré et qui a au moins une partie en saillie (2) faisant saillie d'une surface interne du trou, et une partie de sommet de la au moins une partie en saillie (2) et la au moins une ligne de couronnement (4) du poinçon (3 ou 12) sont configurées pour être alignées entre elles lorsque le poinçon (3 ou 12) doit être inséré dans le trou du moule (1 ou 13) à travers la tôle de base (5) afin de former la tôle de base (5) ayant la partie en saillie (11) formée avec la au moins une fente (10), de sorte que la au moins une fente (10) de la partie en saillie (11) est formée par la partie de bord de la surface périphérique du poinçon (3 ou 12) et au moins la partie en saillie (2) correspondante du moule (1 ou 13) par l'insertion du poinçon (3 ou 12) dans le trou du moule (1 ou 13).

5. Structure de moule selon la revendication 4, dans laquelle la partie en saillie à former au niveau de la tôle de base (5) est cylindrique.
6. Structure de moule selon la revendication 4, dans laquelle la partie en saillie à former au niveau de la tôle de base (5) est polygonale.
7. Structure de moule selon la revendication 4, dans laquelle la au moins une ligne de couronnement (4) de la partie d'extrémité d'attaque du poinçon (3 ou 12) est disposée sensiblement sur le centre du poinçon (3 ou 12).
8. Structure de moule selon la revendication 4, dans laquelle la au moins une ligne de couronnement (4) comprend une pluralité de lignes de couronnement (4) s'étendant chacune de la partie centrale de la partie d'extrémité d'attaque du poinçon (3) sensiblement jusqu'à la partie de bord de la surface périphérique du poinçon (3) pour former la partie d'extrémité d'attaque du poinçon (3) selon une forme pyramida-

le, et la au moins une partie en saillie (2) prévue dans le trou du moule (1) comprend une pluralité de parties en saillie (2) correspondant chacune à l'une de la pluralité de lignes de couronnement (4) de la partie d'extrémité d'attaque du poinçon (3), afin de former la tôle de base (5) ayant la partie en saillie (11) formée avec au moins trois fentes (10) s'étendant de l'extrémité d'attaque à l'extrémité de base de la partie en saillie (11).

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9. Structure de moule selon la revendication 8, dans laquelle la forme pyramidale de la partie d'extrémité d'attaque du poinçon (3) est formée de manière sensiblement symétrique.

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10. Structure de moule selon l'une quelconque des revendications 4 à 9, dans laquelle la partie en saillie (2) est formée selon un angle de 60 degrés à 90 degrés.

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11. Structure de moule selon l'une quelconque des revendications 4 à 9, dans laquelle la partie en saillie (2) est de forme angulaire.

12. Structure de moule selon la revendication 10 ou 11, dans laquelle la partie de sommet de la partie en saillie (2) est formée selon une forme minuscule arrondie.

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FIG. 1

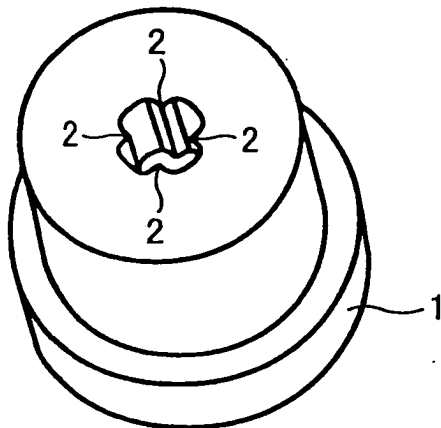


FIG. 2

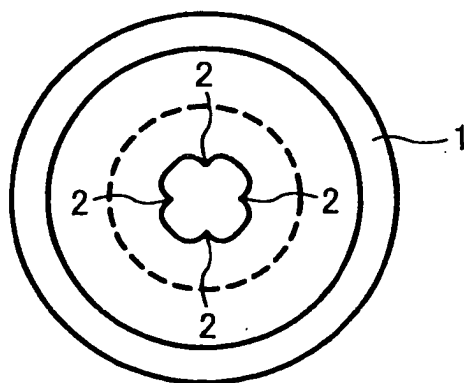


FIG. 3

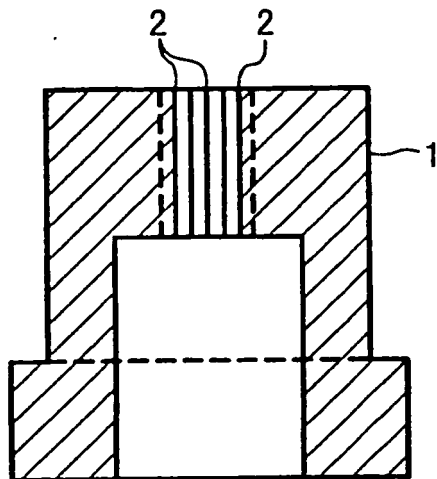


FIG. 4

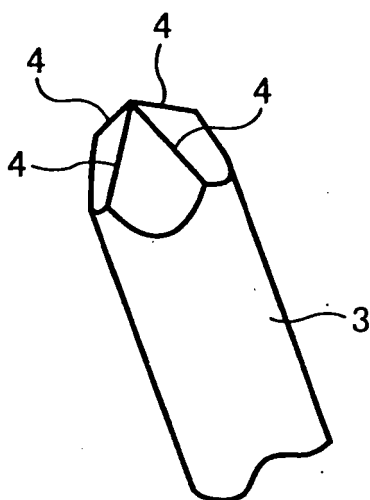


FIG. 5

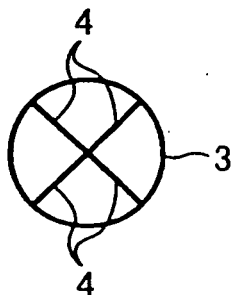


FIG. 6

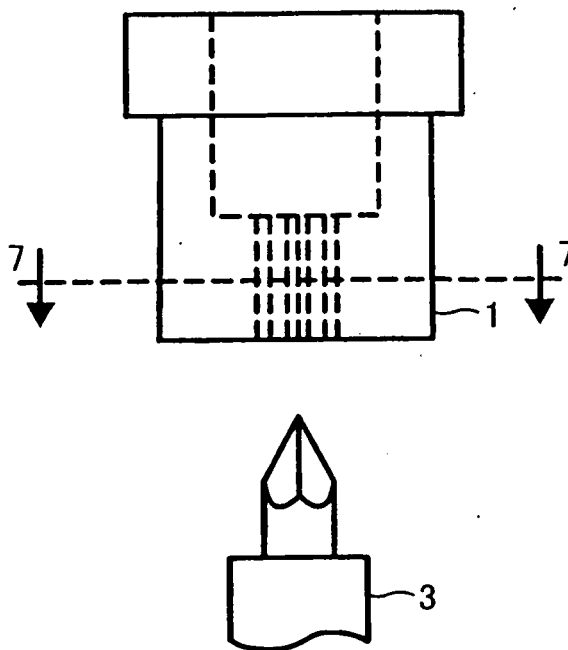


FIG. 7

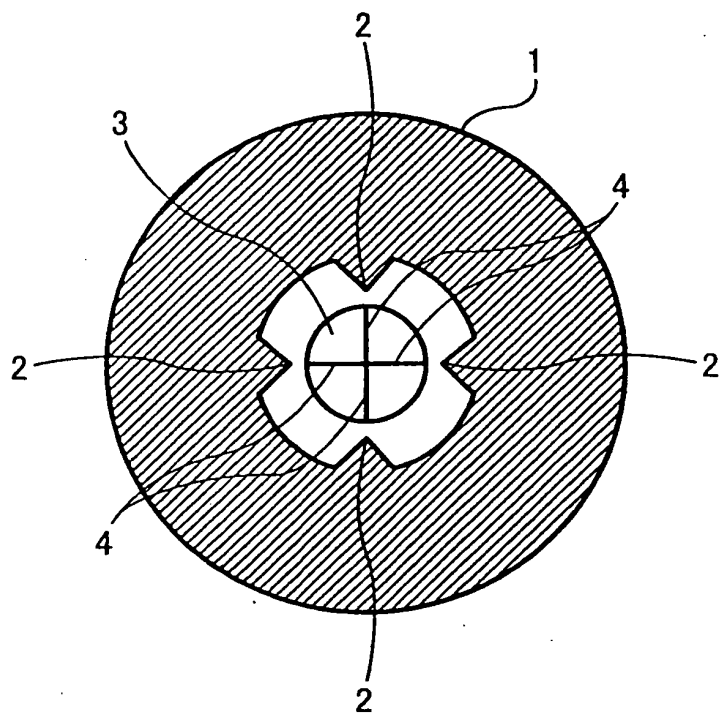


FIG. 8

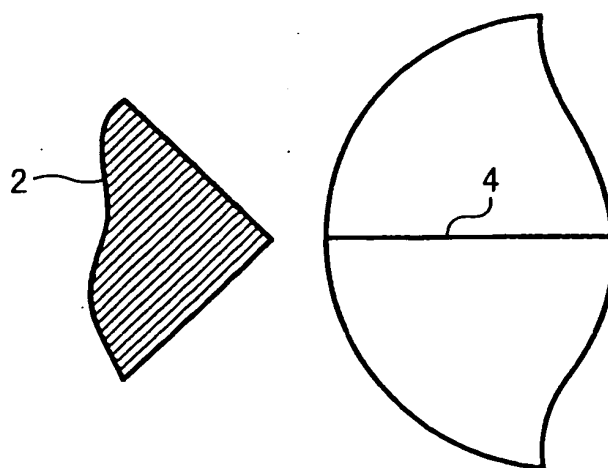


FIG. 9

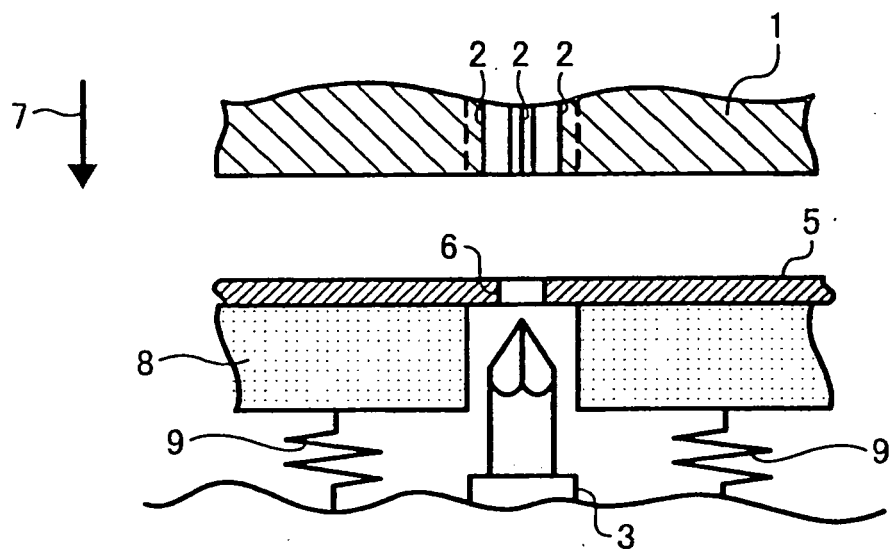


FIG. 10

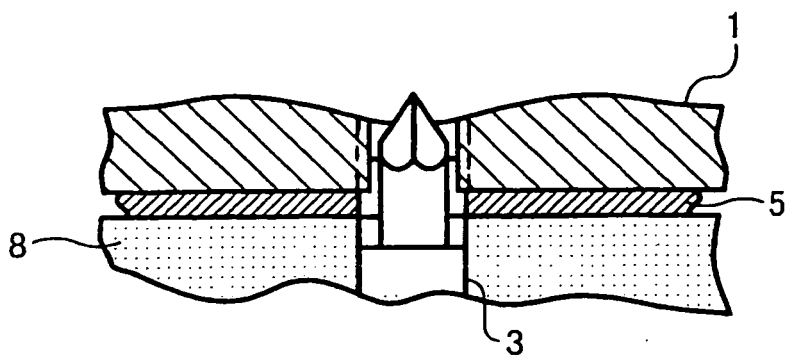


FIG. 11

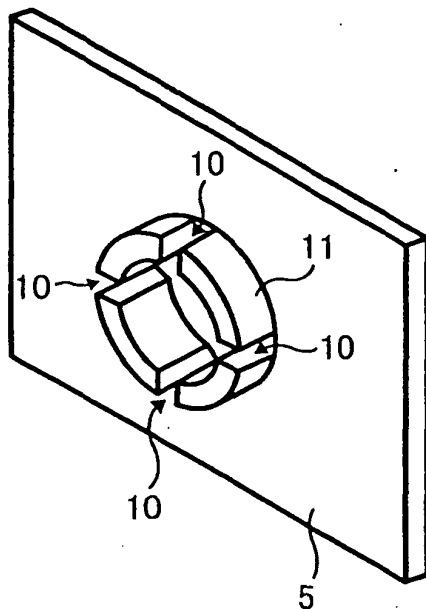


FIG. 12

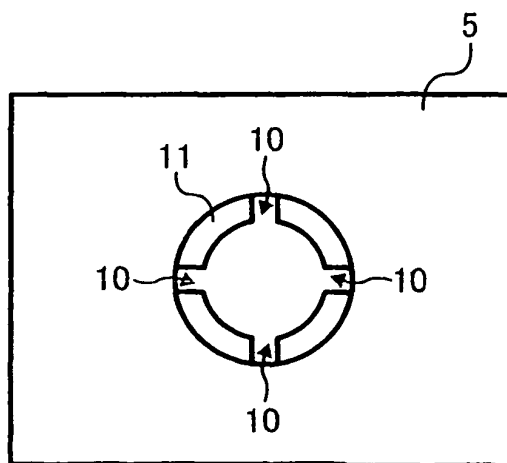


FIG. 13

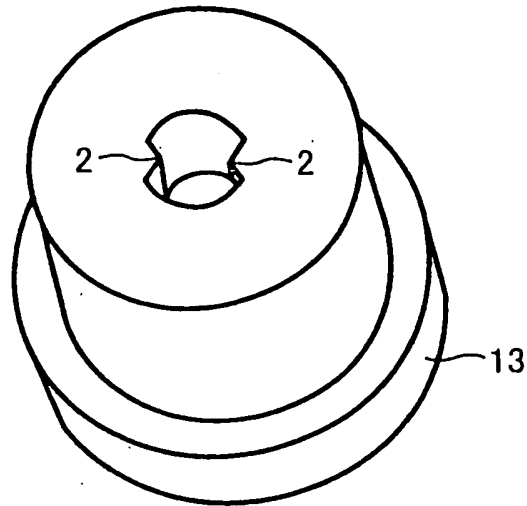


FIG. 14

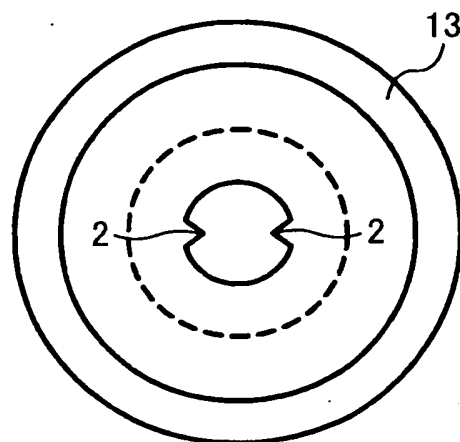


FIG. 15

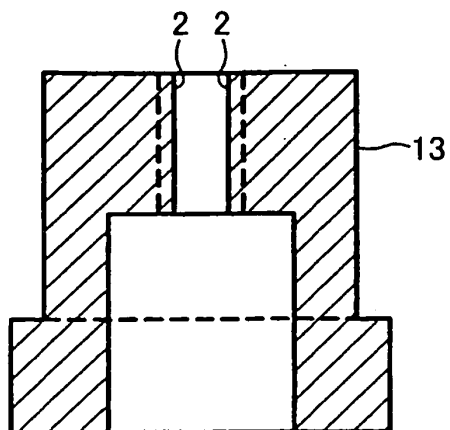


FIG. 16

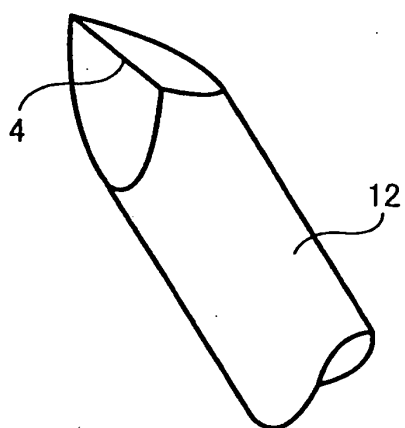


FIG. 17

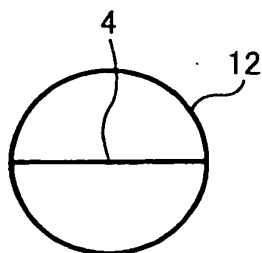


FIG. 18

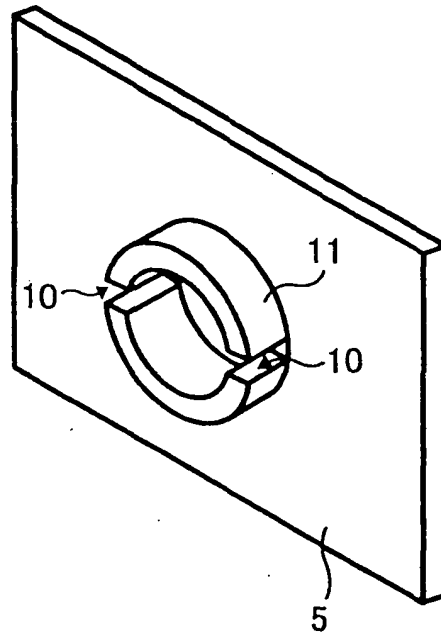
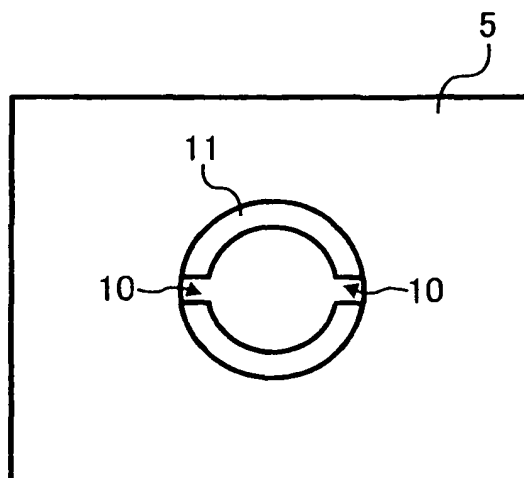


FIG. 19



REFERENCES CITED IN THE DESCRIPTION

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- JP 9201627 A [0002]
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